



## Umbilical Cord Blood as Alternative for Infant Blood In Neonatal Sepsis Evaluation

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## Introduction

- Early onset Group B Streptococcus (GBS)
  - A leading cause of preventable neonatal morbidity and mortality
- Adverse Events
  - 25% to 35% of infants develop neurological and physiological consequences
  - Increased risk with waiting for clinical signs
- Rapid, accurate detection with early initiation of antibiotics is essential.



## Introduction

- Implementation of CDC guidelines
  - resulted in 80% decrease in neonatal GBS infection
  - Complete blood count (CBC) and blood culture
    - Currently drawn from systemic infant blood
- Peripheral venipuncture
  - Painful to the infant
  - Causes distress to family
  - Impacts time management for optimal healthcare
  - Difficult to obtain adequate volume for lab testing





## Problem

- Determine if umbilical cord blood is a valid alternative for infant blood in the evaluation for GBS sepsis
- Compare umbilical cord blood and infant blood
  - CBC immature to total (I:T) granulocyte ratio
    - Marker of infection
  - Blood culture
    - Proof of infection



## Problem Statement

- Use of umbilical cord blood to detect bacteremia would address following:
  - Allow for earliest collection of specimen and enable rapid treatment
  - Spare pain to infant, spare distress to family
  - Allow adequate volume of blood
  - Provide improved utilization of time and resources



## Research Questions

1. In newborns, is the use of umbilical cord blood a valid alternative to infant blood, in the evaluation of group B streptococcus sepsis through I:T ratio?
2. In newborns, is the use of umbilical cord blood a valid alternative to infant blood, in the evaluation of group B streptococcus sepsis through blood culture?
3. Is there a significant difference in length of time from delivery to obtaining the umbilical cord blood sample compared to the infant blood sample, as measured by length of time from birth to sample collection?
4. Is there a significant difference in the volume of blood taken from the umbilical cord for blood culture compared to the volume obtained from the infant?





## Conceptual Framework

- Synactive Theory of Infant Development
  - Infant recipient and active participant in care with reactions
  - Caregiver acknowledges pain and modifies care
- AAP Policy statement on avoidance of pain
- Early life pain



## Definition of Terms

- Umbilical Cord Blood:
  - Blood drawn from a vein or artery of a segment of umbilical cord that has been clamped at both ends, separated from the placenta and infant
- Infant Blood
  - Specimen of blood that has been obtained systemically from an infant
- Immature to Total Ratio (I:T Ratio)
  - Ratio of the immature to total granulocytes on the CBC differential white count
  - Immature count = absolute number of all neutrophils excluding the mature neutrophils.
  - Antibiotic decision based on normal or abnormal I :T ratio





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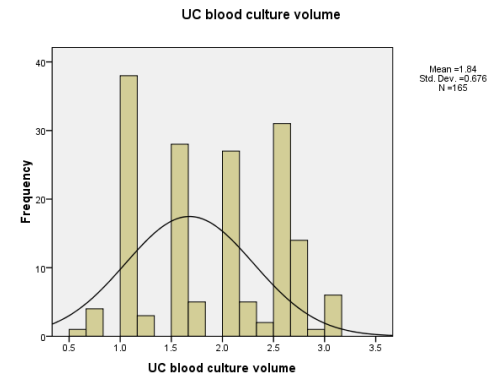
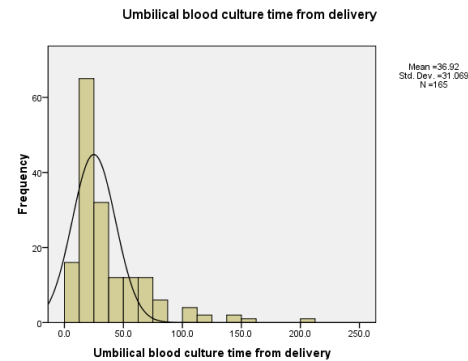
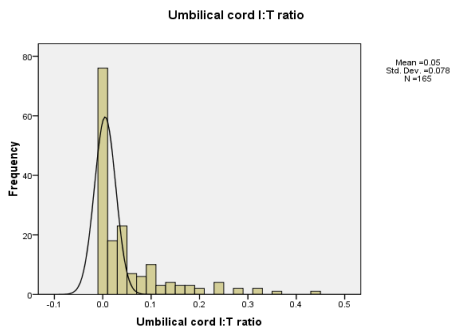
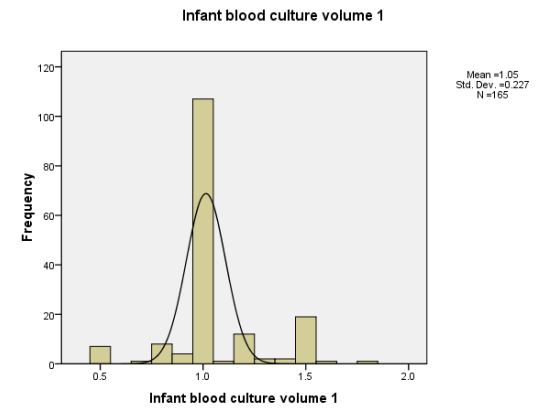
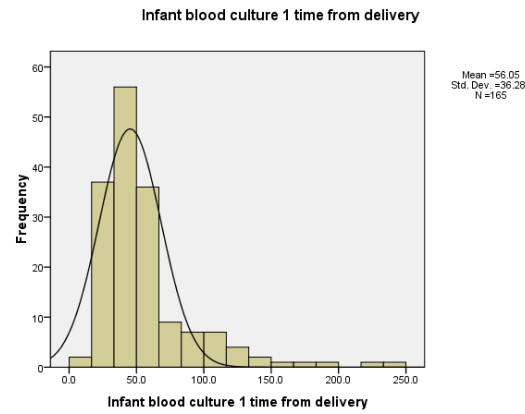
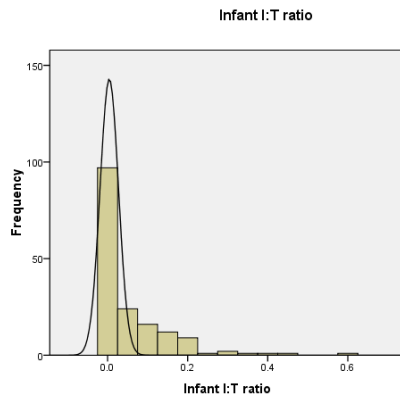


## Population and Sample

- Convenience sample of 165 term and preterm infants born
  - Meeting inclusion criteria
- Data previously collected
- Post Priori Power analysis
  - Power .832
  - Alpha 0.05
  - Effect Size .23



## Infant and Umbilical Cord Distributions for I:T Ratio, Time and Volume





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Questions	Independent Variable	Dependent Variable	Statistical Test	Results
1. Is the use of umbilical cord blood a valid alternative to infant blood, in the evaluation of GBS sepsis through I:T ratio?	IV#1:Umbilical Cord Blood IV #2: Infant Blood	DV: I:T Ratio	Pearson correlation or Spearman Rho	Assumption of normality not met. <i>Spearman Rho</i> = .536., $p = .01$ , $N = 165$
2. Is the use of umbilical cord blood a valid alternative to infant blood, in the evaluation of GBS sepsis through blood culture?	IV#1: Umbilical Cord Blood IV#2: Infant Blood	DV: Blood culture results (+ versus -)	McNemar Chi square	Unable to determine due to no positive blood cultures in either sample.
3. Is there a significant difference in length of time from delivery to obtaining the umbilical cord blood sample as compared to the length of time from birth to sample collection?	IV#1: Umbilical Cord Blood IV#2: Infant Blood	DV: Time measured in minutes from birth to sample collection	Dependent sample t-test or Wilcoxon Signed Ranks	Wilcoxon z score = -5.822 $N = 165$ , $< .001$ (mean = 36.9 SD= 31.07) , mean 56.05 (SD=36.29)
4. Is there a significant difference in the volume of blood taken from the umbilical cord for blood culture compared to the volume obtained from the infant?	IV#1: Umbilical Cord Blood IV#2: Infant Blood	DV: Volume of blood measured in ccs taken for blood culture	Dependent sample t-test or Wilcoxon Signed Ranks	Wilcoxon z score = -9.526 $N = 165$ , $< .001$ , (mean = 1.84, SD = 0.68, mean = 1.05, SD = 0.23)

## Summary

- Umbilical cord blood could be good alternative for GBS screening
  - As predictive as systemic infant blood
- Use of umbilical cord blood would:
  - Spare the infant a painful procedure
  - Spare the family distress
  - Provide improved time utilization
  - Allow earlier initiation of necessary treatment



## Conclusions

- I:T ratio from the umbilical cord is an effective diagnostic option as compared to infant blood.
- Blood culture results from umbilical cord was equivalent to infant blood in this sample – no growth in both methods.
- Umbilical cord blood should be option when tests are sensitive to blood sample volume.
- Umbilical cord blood should be option when decreased sample collection time is required.





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